

# Executive Summary

Natural gas is a critical source of energy and raw material, and will play a vital role in achieving the nation's economic and environmental goals. Current higher gas prices are the result of a fundamental shift in the supply and demand balance. North America is moving to a period in its history in which it will no longer be self-reliant in meeting its growing natural gas needs; production from traditional U.S. and Canadian basins has plateaued. Government policy encourages the use of natural gas but does not address the corresponding need for additional natural gas supplies. A status quo approach to these conflicting policies will result in undesirable impacts to consumers and the economy, if not addressed. The solution is a balanced portfolio that includes increased energy efficiency and conservation; alternate energy sources for industrial consumers and power generators, including renewables; gas resources from previously inaccessible areas of the United States; liquefied natural gas (LNG) imports; and gas from the Arctic. The following is a summary of key findings and of recommendations that will help achieve a balanced future for natural gas.

## ALTERNATIVE SCENARIOS

A status quo approach to natural gas policy yields undesirable outcomes because it discourages economic fuel choice, new supplies from traditional basins and Alaska, and new LNG terminal capacity. The NPC developed two scenarios of future supply and demand that move beyond the status quo. Both require significant actions by policy makers and industry stakeholders to effect change. These scenarios, "Reactive Path" and "Balanced Future," are discussed below.

The Reactive Path scenario assumes continued conflict between natural gas supply and demand policies that support natural gas use, but tend to discourage supply development. This scenario results in continued tightness in supply and demand leading to higher natural gas prices and price volatility over the study period. To achieve even the Reactive Path outcome, the following actions must be taken:

- Continue improvements in energy efficiency and conservation.
- Enact enabling legislation for the Alaskan gas pipeline.
- Overcome local siting opposition to new LNG terminals.
- Streamline permitting processes to allow increased drilling and development activity in the Rocky Mountains.

- Implement a Joint Agency Review process for new infrastructure.
- Clarify New Source Review requirements for industrial and power plant facilities.

The Balanced Future scenario builds in the effects of supportive policies for supply development and allows greater flexibility in fuel-switching and fuel choice. This results in a more favorable balance between supply and demand, price projections more in line with alternate fuels, and lower prices for consumers.

This scenario allows for a balanced future by:

- Improving demand flexibility and efficiency.
- Increasing supply diversity.
- Sustaining and enhancing infrastructure.
- Promoting efficiency of markets.

It is important to note that there are uncertainties, which could significantly impact the supply/demand balance for each scenario. These uncertainties include, but are not limited to, weather, oil price, economic growth, and potential treatment of carbon dioxide (CO<sub>2</sub>) emissions.

This report analyzes supply, demand, and the infrastructure for natural gas in North America in the near, mid, and long term (through 2025). Recommendations from this analysis are intended to preserve the critical benefits of natural gas to the North American economy and environment.

## FINDINGS

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There has been a fundamental shift in the natural gas supply/demand balance that has resulted in higher prices and volatility in recent years. This situation is expected to continue, but can be moderated.

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### **Demand**

Greater energy efficiency and conservation are vital near-term and long-term mechanisms for moderating price levels and reducing volatility.

Power generators and industrial consumers are more dependent on gas-fired equipment and less able to respond to higher gas prices by utilizing alternate sources of energy.

Gas consumption will grow, but such growth will be moderated as the most price-sensitive industries become less competitive, causing some industries and associated jobs to relocate outside North America.

### **Supply**

Traditional North American producing areas will provide 75% of long-term U.S. gas needs, but will be unable to meet projected demand.

Increased access to U.S. resources (excluding designated wilderness areas and national parks) could save consumers \$300 billion in natural gas costs over the next 20 years.

New, large-scale resources such as LNG and Arctic gas are available and could meet 20-25% of demand, but are higher-cost, have longer lead times, and face major barriers to development.

### **Infrastructure**

Pipeline and distribution investments will average \$8 billion per year, with an increasing share required to sustain the reliability of existing infrastructure

Regulatory barriers to long-term contracts for transportation and storage impair infrastructure investment.

### **Markets**

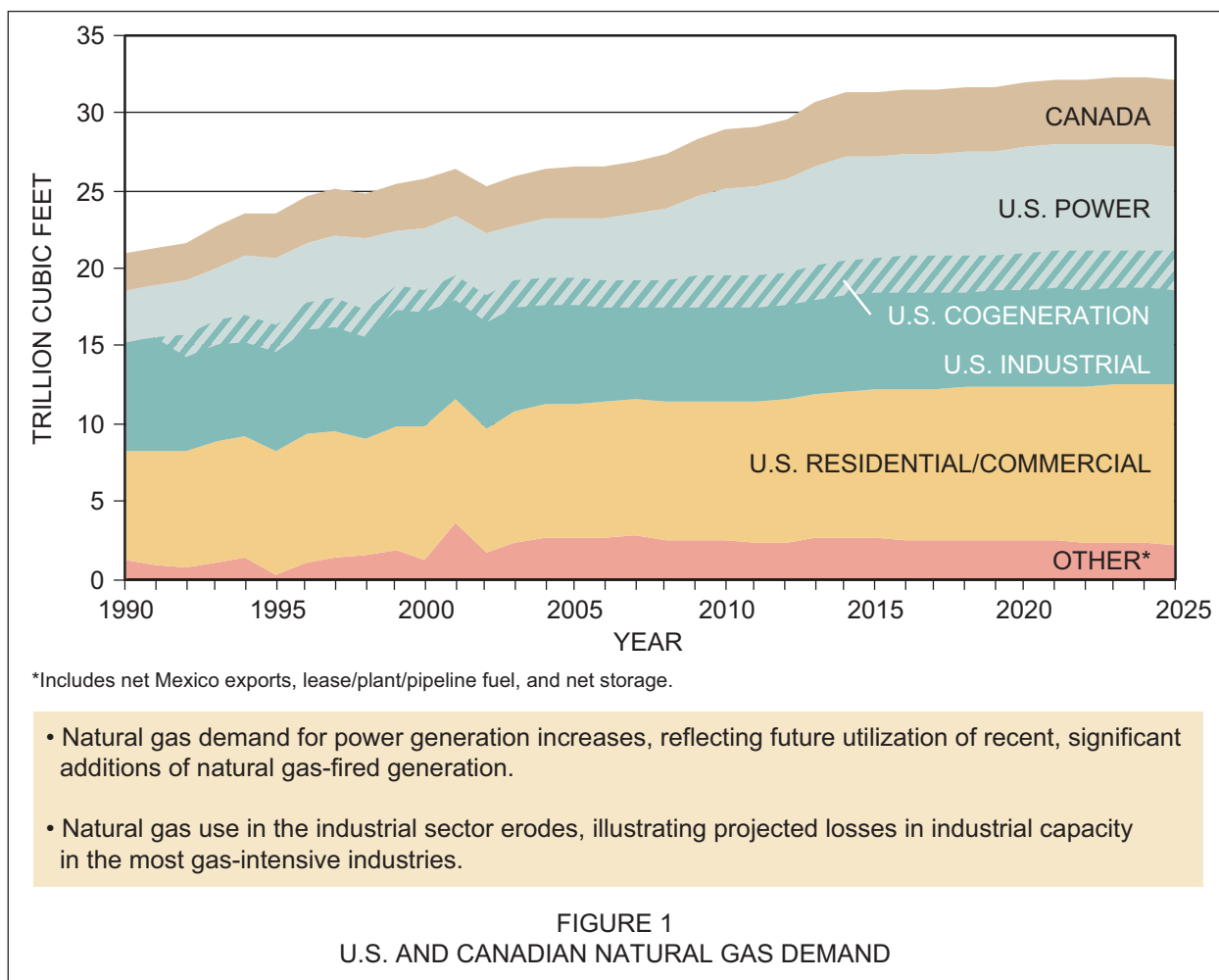
Price volatility is a fundamental aspect of a free market, reflecting the variable nature of demand and supply; physical and risk management tools allow many market participants to moderate the effects of volatility.

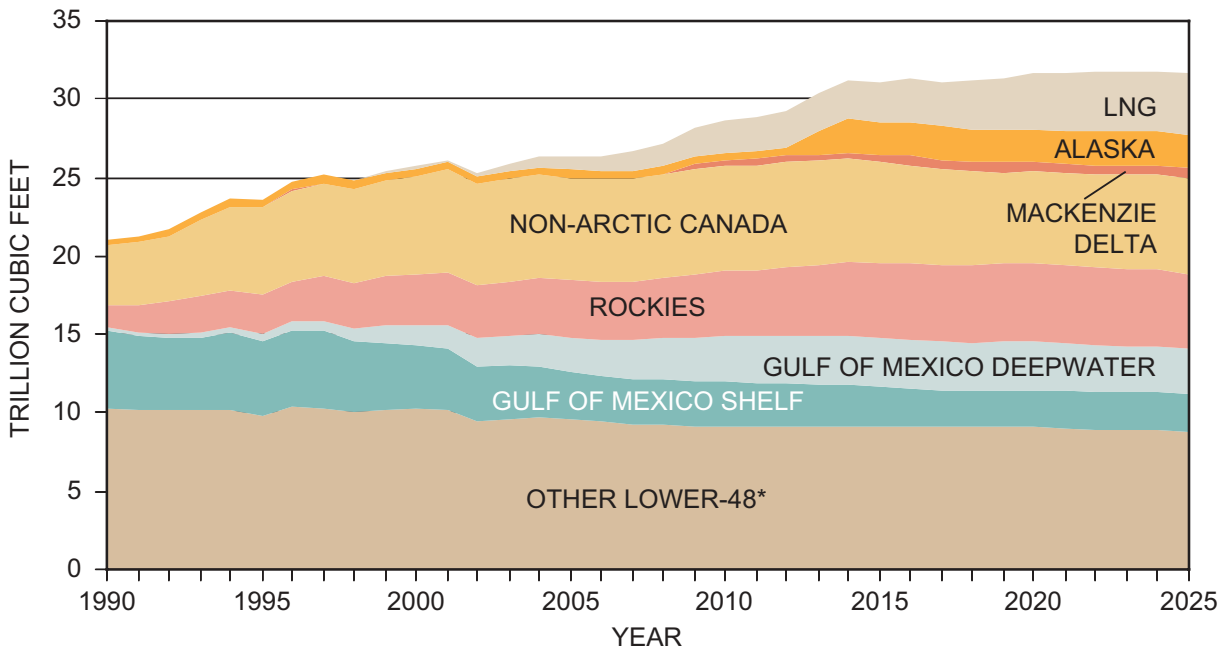
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A balanced future that includes increased energy efficiency, immediate development of new resources, and flexibility in fuel choice, could save \$1 trillion in U.S. natural gas costs over the next 20 years. Public policy must support these objectives.

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National Petroleum Council projections of future demand and supply are illustrated in Figures 1 and 2. These figures illustrate some of the key attributes of the NPC outlooks.





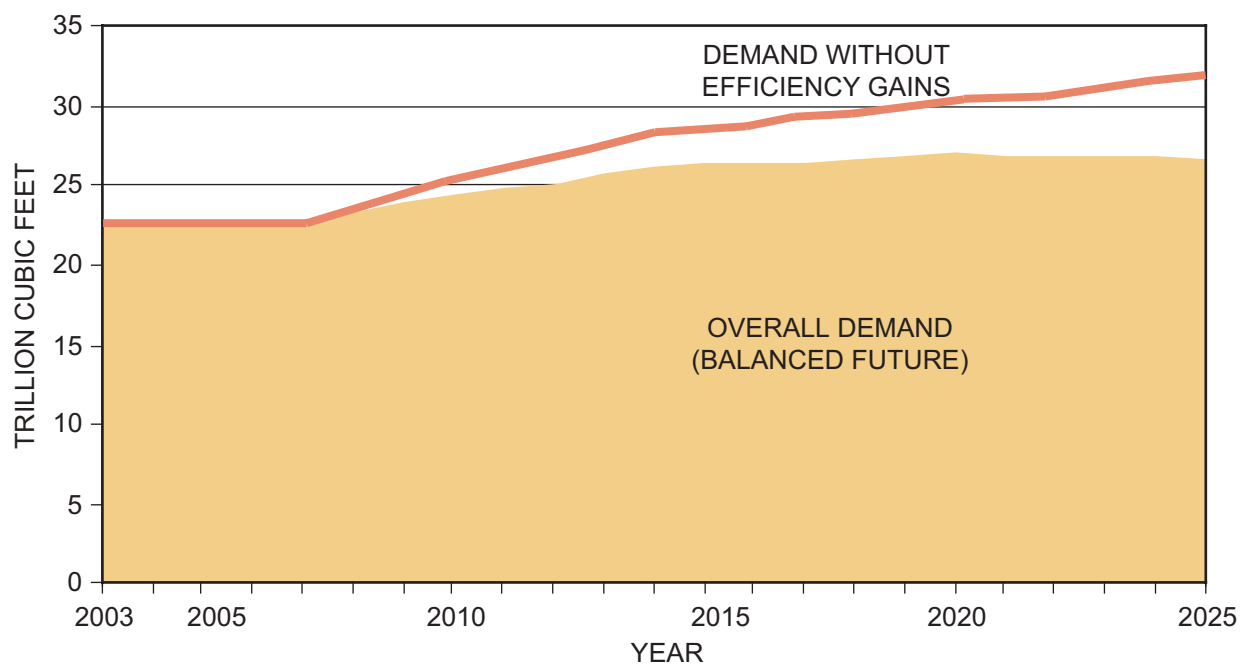
\* Includes lower-48 production, ethane rejection, and supplemental gas.

- Production from traditional basins remains strong but has plateaued; Rockies and deepwater Gulf of Mexico offset declines in other areas.
- Growth is driven by LNG imports and Arctic supply.

FIGURE 2  
U.S. AND CANADIAN NATURAL GAS SUPPLY

## NATURAL GAS DEMAND

Natural gas supplies approximately 25% of U.S. energy, generating about 19% of electric power, supplying heat to over 60 million households, and providing over 40% of all primary energy for industries. The NPC assessed future demand in each of the key consumer sectors – residential/commercial, power generation, and industrial. These assessments focused on the increased capability to consume natural gas in power generation and the effect of higher prices on industrial consumers, commercial establishments, and residential consumers. These analyses incorporate the effects of energy efficiency improvements in each of these consumer sectors, as shown in Figure 3. Figure 4 shows the diverse nature of natural gas demand in North America, on both a geographic and sectoral basis.



\* Energy efficiency gains in NPC modeling of future gas demand are principally from: decreased electric power demand intensity; increased efficiency in gas-fired power generation, industrial boilers, and industrial process heat; and efficiency gains in commercial and residential gas consumption.

FIGURE 3  
ENERGY EFFICIENCY EFFECT ON GAS CONSUMPTION\*

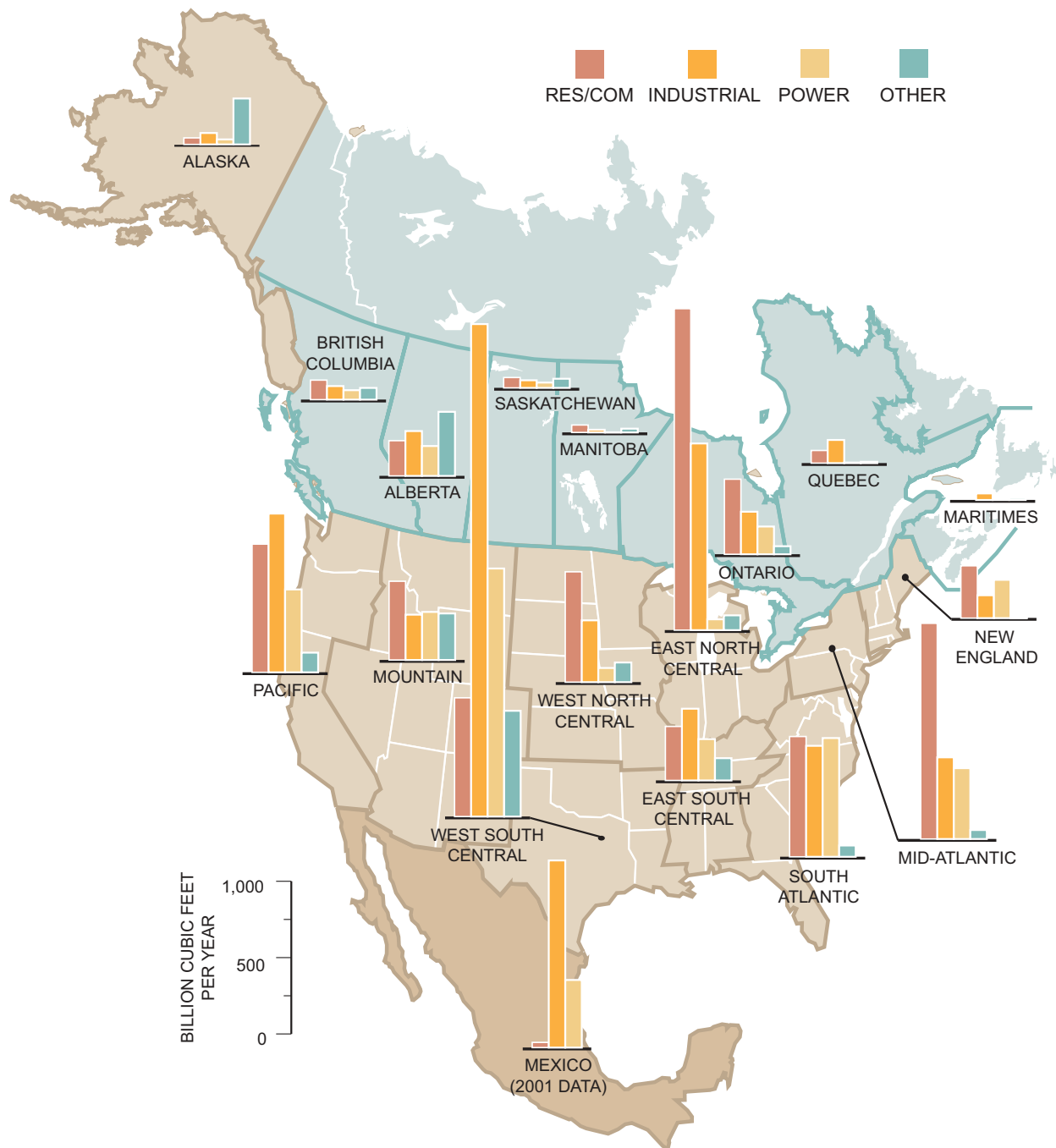


FIGURE 4  
U.S. AND CANADIAN NATURAL GAS DEMAND BY SECTOR, 2002

## NATURAL GAS SUPPLY

Abundant natural gas resources exist in North America and worldwide. A thorough study was conducted to assess the remaining potential of traditional North American natural gas producing basins, as well as the potential for growth in supply from areas such as the deepwater Gulf of Mexico, the Rockies, Arctic regions, and imported LNG.

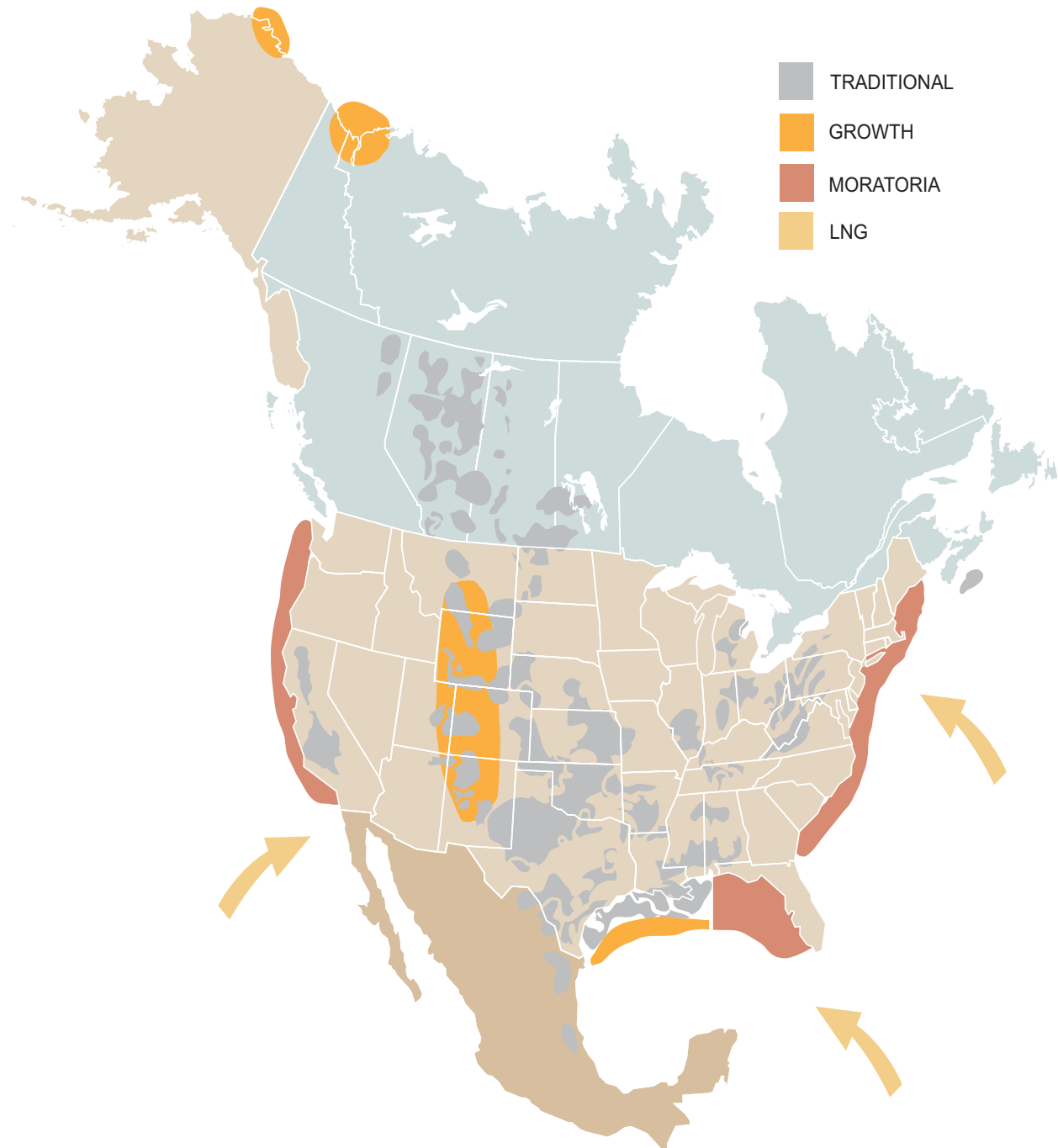


FIGURE 5  
SOURCES OF NATURAL GAS SUPPLY



## RANGE OF POTENTIAL PRICES

Supply and demand will balance at a higher range of prices than historical levels. That price range will be primarily driven by demand response through efficiency and fuel flexibility, the ability to increase conventional and nonconventional supply from North America including the Arctic, and increasing access to world resources through LNG. National Petroleum Council price ranges for the alternate scenarios are illustrated in Figure 6. These are not status quo scenarios. They both require significant initiative by policy makers and industry stakeholders to implement the recommendations of this report in order to achieve a balanced future.

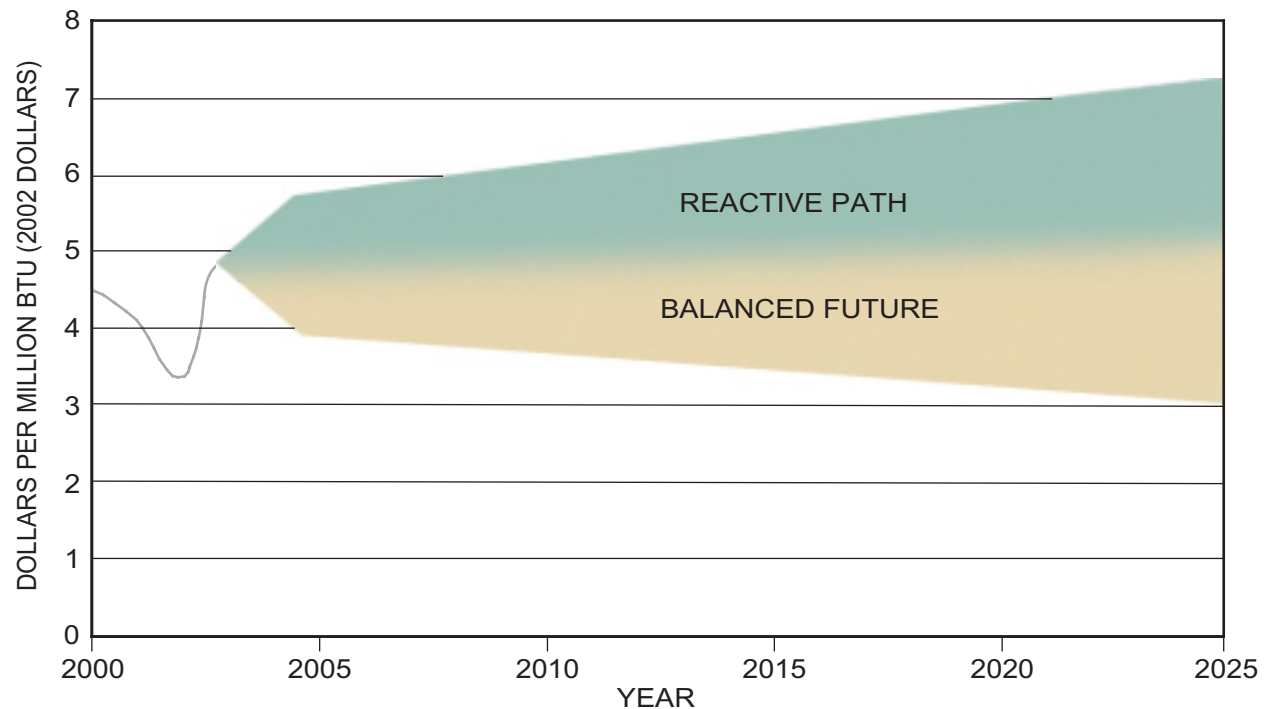


FIGURE 6  
AVERAGE ANNUAL HENRY HUB PRICES

## RECOMMENDATIONS

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### **Improve Demand Flexibility and Efficiency**

Encourage increased efficiency and conservation through market-oriented initiatives and consumer education.

Increase industrial and power generation capability to utilize alternate fuels.

### **Sustain and Enhance Infrastructure**

Provide regulatory certainty by maintaining a consistent cost-recovery and contracting environment and removing regulatory barriers to long-term capacity contracting and cost recovery of collaborative research.

Permit projects within a one-year period utilizing a “Joint Agency Review Process.”

### **Increase Supply Diversity**

Increase access and reduce permitting impediments to development of lower-48 natural gas resources.

Enact enabling legislation in 2003 for an Alaska gas pipeline.

Process LNG project permit applications within one year.

### **Promote Efficiency of Markets**

Improve transparency of price reporting.

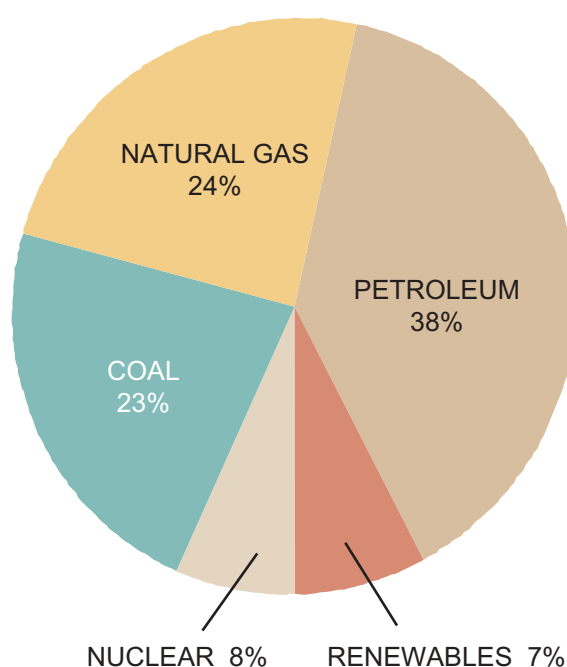
Expand and enhance natural gas market data collection and reporting.

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Overall, this comprehensive NPC report provides a number of recommendations, all of which require action and are required to achieve the Balanced Future, thus creating a more favorable outcome for consumers and the economy.

# Introduction

Natural gas is a critical source of energy and raw material, permeating virtually all sectors of the economy. Today natural gas provides nearly one-quarter of U.S. energy requirements<sup>2</sup> and is an environmentally superior fuel, thereby contributing significantly to reduced levels of air pollutants. It provides about 19% of electric power generation and is a clean fuel for heating and cooking in over 60 million U.S. households. U.S. industries get over 40% of all primary energy from natural gas. Figure 7 illustrates the contribution of natural gas to U.S. energy needs, and Figure 8 shows gas use by sector.



Source: Energy Information Administration.

FIGURE 7  
AVERAGE ANNUAL ENERGY USE, 1997-2001  
97 TCF PER YEAR (EQUIVALENT)

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<sup>2</sup> Data from Energy Information Administration, Monthly Energy Review, April 2003.

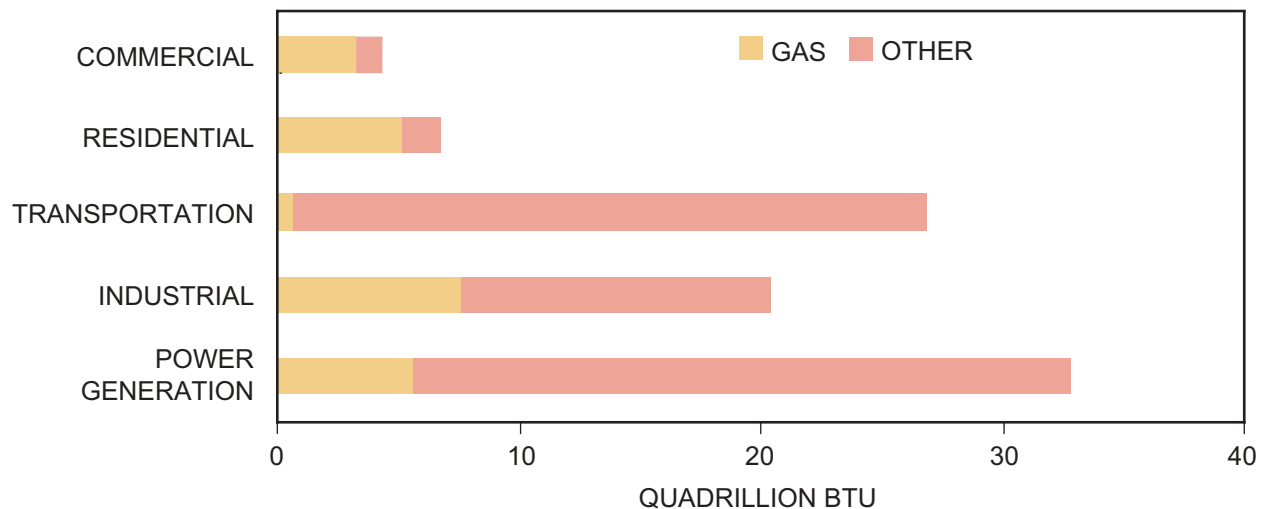


FIGURE 8  
U.S. PRIMARY ENERGY USE BY SECTOR, YEAR 2002

North America's natural gas exploration and production industry has been successful in efficiently finding and developing the continent's indigenous resources, and an extensive infrastructure has been developed to efficiently transport natural gas from its diverse sources to its multiple markets. Technology advances throughout the supply chain have increased supply, reduced costs, and minimized environmental effects. Effective mechanisms for the sale, purchase, and pricing of natural gas have evolved, and there has been a progressive reliance in recent years on competition and open markets at each point along the natural gas supply value chain.

From the 1930s until the 1980s most of the interstate natural gas industry was highly regulated. Many of these regulations were in conflict. Low, regulated prices constrained supply growth while demand grew rapidly. During the 1970s these policies resulted in gas shortages. Additional regulations in the late 1970s attempted to allocate and curtail gas deliveries to some customers, such as industrial consumers and electric generators. These regulations exacted an enormous cost on U.S. industry and consumers, and ultimately on the U.S. economy. Price controls on natural gas were effectively removed in the late 1980s and gas futures trading on the NYMEX began in April 1990.

Today, many regulations and policies affecting natural gas are in conflict. Public policies are promoting the use of natural gas as an efficient and environmentally attractive fuel. These policies have led to restrictions on fuels other than natural gas for the siting of power generation and industrial facilities, restrictions on fuel switching, and fuel choice limitations. Other laws and regulations have been enacted that limit access to gas-prone areas – areas where gas can be explored for and produced in an efficient and environmentally friendly manner – and there are outright bans to drilling in certain regions. There are laws and regulations that unnecessarily hinder pipeline and infrastructure siting or interfere with the functionality of the market in ways that lead to inefficiencies. Overall, these conflicting policies have contributed to today's tight supply-demand balance, with higher and volatile gas prices. The beneficial effects of additional gas use can be achieved more efficiently and at a lower cost with policies that eliminate the current conflicts.

In order to illustrate the findings and recommendations of this study, the NPC developed two contrasting scenarios that represent plausible and feasible future trends in North American natural gas markets. All of the Task Groups were involved in the development of these scenarios, including representatives of producers, pipelines, distributors, final consumers, power companies and government agencies. These scenarios and their results should not be considered as forecasts but as internally consistent frameworks for analyzing choices open to the principal stakeholders in North American gas over the study time period.

Each of the two scenarios has different assumptions regarding some of the key variables related to supply and demand responses to public policy choices. These key variables include degrees of access to gas resources, greater energy efficiency and conservation, and increased flexibility to use fuels other than gas for industry and power generation. The two scenarios result in contrasting demand, supply, infrastructure, and price profiles. The names of the two scenarios are “Reactive Path” and “Balanced Future.” The full details of the assumptions used in each of Reactive Path and Balanced Future can be found in the NPC Study Integrated Report.

Reactive Path assumes current laws remain in effect, and governmental policies at federal, state/provincial, and local levels continue to broadly encourage gas usage while discouraging access to lower-48 gas resources. However, in addition to these broad policies, the assumptions built into this case acknowledge that resultant high natural gas prices will likely be reflected in significant societal pressure to allow reasonable, economically driven choices to occur on both the consuming and producing segments of the natural gas industry. Thus, the Reactive Path is not a status quo outlook. In essence, market participants, including public policy makers, “react” to the current situation while inherent conflicts continue. The supply response assumes a considerable amount of success and deviation from past trends, evidenced by a major expansion of LNG facilities, construction of arctic pipelines, and a significant response in lower-48 production from accessible areas. Overall demand levels from both NPC scenarios are lower than other outlooks, resulting in less upward pressure on the supply/demand balance. Even with uncertainty surrounding air quality regulations, the modeling effort projects construction of new, state of the art, emission controlled coal plants at levels that approach the prior coal boom years in the 1970s. Together, this scenario implies a degree of success in supply and demand responses significantly beyond what has been demonstrated over recent years.

The results of the Reactive Path show that, even though consumers and producers act rationally within this policy framework, impediments to growing natural gas supply, and lack of flexibility of fuel consumption, inevitably lead to higher prices, which, in turn, bring negative impacts on gas intensive industries and the economy as a whole. Price volatility remains a consistent feature of gas markets in this scenario. Perhaps Federal Reserve Board Chairman Alan Greenspan provided the best characterization of the conflict between policy choices in his testimony to the United States Senate Committee on Energy and Natural Resources: *“We have been struggling to reach an agreeable tradeoff between environmental and energy concerns for decades. I do not doubt we will continue to fine-tune our areas of consensus. But it is essential that our policies be consistent. For example, we cannot, on the one hand, encourage the use of environmentally desirable natural gas in this country while being conflicted on larger imports of LNG. Such contradictions are resolved only by debilitating spikes in price.”*

Alternatively, Balanced Future is a scenario in which government policies are focused on eliminating barriers to market efficiencies. This scenario enables natural gas markets to develop in a manner in which improved economic and environmental choices can be made by both producers and consumers. On the demand side, opportunities for conservation, energy efficiency, and fuel flexibility are both authorized and encouraged. On the supply side, barriers to development of new natural gas sources are progressively lowered, both for domestic and imported natural gas. The result, with enhanced supply and more flexible demand, would be a market with lower gas prices and less potential for upward price spikes. This case is a better outcome for North American consumers than the continuing market tightness associated with the Reactive Path.

It would be possible to construct many different scenarios or visions of the future to illustrate the NPC analysis. For example, neither the Reactive Path nor the Balanced Future scenario considers the effect of not developing major new LNG import facilities or the Arctic gas pipelines; neither scenario considers actions that might severely limit CO<sub>2</sub> emissions or the permitted carbon content of fuels; neither scenario attempts to speculate on ground-breaking new technology that could fundamentally alter demand patterns or supply potential. The NPC did not consider such possibilities as being likely outcomes to be modeled in the base scenarios. However, each base scenario was tested against variabilities in many of the major underlying assumptions, such as weather patterns, economic growth, the price of competing fuels, the size of the domestic gas resource base, timing of infrastructure implementation, and the role of other electric generation technologies such as nuclear and hydroelectric plants. These sensitivity analyses provide additional directional insight to the conclusions reached from the base scenarios and reinforce the study findings and recommendations.

In either scenario, it is clear that North American natural gas supplies from traditional basins will be insufficient to meet projected demand; choices must be made immediately to determine how the nation's natural gas needs will be met in the future. The best solution to these issues requires actions on multiple paths. Flexibility in fuel use must be encouraged, diverse supply sources must be developed, and infrastructure must be made to be as reliable as possible. Policy choices must consider domestic and foreign sources of supply, large and small increments of production, and the use of other fuels as well as gas for power generation. All choices face obstacles, but all must be supported if robust competition among energy alternatives and the lowest cost for consumers and the nation are to be achieved. The benefits of the Balanced Future scenario to the economy and environment unfold over time; but it is important that these policy changes be implemented now; otherwise their benefits will be pushed that much farther into the future, and the uneasy supply/demand balance we are experiencing will continue.

The findings of the National Petroleum Council described in this volume of the report represent the conclusions of the Council from the detailed analysis undertaken over the past year. They provide the clear motivation for the recommendations that follow. Collectively and individually, policy makers will make decisions affecting the future of natural gas in the economy. These choices will have significant effects on resource availability, on natural gas production, on the cost-effective use of natural gas, on the capacity of infrastructure to serve markets, and on prices and price volatility. Prompt implementation of the NPC's recommendations will reduce the conflicts in current public policy and benefit both consumers and the environment.

**The National Petroleum Council has identified the following key findings based on its analysis of the natural gas market:**

- There has been a fundamental shift in the natural gas supply/demand balance that has resulted in higher prices and volatility in recent years. This situation is expected to continue, but can be moderated.
- Greater energy efficiency and conservation are vital near-term and long-term mechanisms for moderating price levels and reducing volatility.
- Power generators and industrial consumers are more dependent on gas-fired equipment and less able to respond to higher gas prices by utilizing alternate sources of energy.
- Gas consumption will grow, but such growth will be moderated as the most price-sensitive industries become less competitive, causing some industries and associated jobs to relocate outside North America.
- Traditional North American producing areas will provide 75% of long-term U.S. gas needs, but will be unable to meet projected demand.
- Increased access to U.S. resources (excluding designated wilderness areas and national parks) could save \$300 billion in natural gas costs over the next 20 years.
- New, large-scale resources such as LNG and Arctic gas are available and could meet 20-25% of demand, but are higher-cost, have longer lead times, and face major barriers to development.
- Pipeline and distribution investments will average \$8 billion per year, with an increasing share required to sustain the reliability of existing infrastructure.
- Regulatory barriers to long-term contracts for transportation and storage impair infrastructure investment.
- Price volatility is a fundamental aspect of a free market, reflecting the variable nature of demand and supply; physical and risk management tools allow many consumers to moderate the effects of volatility.
- A balanced future that includes increased energy efficiency, immediate development of new resources, and flexibility in fuel choice could save \$1 trillion in U.S. natural gas costs over the next 20 years. Public policy must support these objectives.

